

Amendments to the Drawings:

The attached sheet of drawings includes changes to Figure 1. This sheet, which includes Figures 1-3, replaces the sheet filed January 31, 2002 including Figures 1-3. In Figure 1, reference numeral "120" has been changed to "102."

Attachment: Replacement Sheet
Annotated Sheet Showing Changes

REMARKS

I. PRELIMINARY REMARKS

Minor amendments have been made to the drawings and specification. Claims 82 and 83 have been amended.¹ No claims have been canceled or added. Claims 1-9, 11-17, 20 and 82-89 remain in the application. Reexamination and reconsideration of the application, as amended, are respectfully requested.

II. REQUEST FOR WITHDRAWAL OF THE FINALITY OF THE OUTSTANDING OFFICE ACTION

Claim 16 was rejected under 35 U.S.C. § 102 as being purportedly anticipated the Kindler '594 patent in the Office Action dated November 18, 2003. Applicant re-wrote claim 16 in independent form in the amendment filed February 12, 2004 and argued that claim 16 is patentable over the Kindler '594 patent.² In the outstanding Office Action, claim 16 has been rejected under **35 U.S.C. § 103** as being purportedly obvious over the combined teachings of the Kindler '594 patent and the Pun '382 patent. Thus, a new ground of rejection has been applied to claim 16. As claim 16 was not substantively amended in the amendment filed February 12, 2004, the new ground of rejection precludes a final rejection. [See MPEP § 706.07(a).] Applicant respectfully submits that a supplemental, non-final Office Action should be issued which clearly indicates that this is the case.

¹ The amendments above are not intended to change the scope of the claimed inventions. Rather, such amendments are being made solely in response to the Examiner's rejection and objection under 35 U.S.C. §§ 112 and 132.

² Applicant notes that the portion of previously dependent claim 16 which read "claimed in claim 14, wherein the step of directing a spray of fuel droplets onto the anode comprises the steps of:" was inadvertently deleted instead of being shown in ~~strike through~~. To the extent that this minor informality caused the Examiner not realize that claim 16 was being re-written in independent form, applicant apologizes for any inconvenience.

III. OBJECTION AND REJECTION UNDER 35 U.S.C. §§ 112 AND 132

A. The Objection and Rejection

The amendment filed February 12, 2004 has been objected to under 35 U.S.C. § 132 for purportedly introducing new matter into the specification. Claims 82-89 have been rejected under 35 U.S.C. § 112, first paragraph, as purportedly containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the art that the inventor(s), at the time the application was filed, has possession of the invention.

Specifically, the Office Action indicated that references in the claims to a fuel supply path (i.e. the path along which the fuel droplets are directed) that is either non-perpendicular to the anode plane, or substantially parallel to the anode plane, are not supported by the original disclosure.

The objection under 35 U.S.C. § 132 and rejection under 35 U.S.C. § 112, first paragraph, are respectfully traversed with respect to the specification and claims as amended above. Reconsideration thereof is respectfully requested.

B. The New Matter Objection

With respect to the “new matter” objection under 35 U.S.C. § 132, the present application, as originally filed, included a number of exemplary embodiments in which the fuel droplets travel along a path that is non-perpendicular to (and substantially parallel to) to the anode surfaces. Referring to Figures 1 and 3, which are reproduced on the following page, the application as originally filed indicated that “the spaces between adjacent anodes 106 define fuel passages 114” and that the anodes have surfaces 124. [See page 5, lines 1-10.] The arrows in Figure 1 clearly

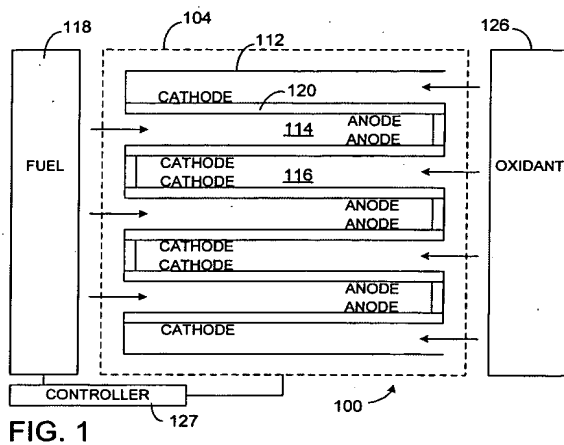


FIG. 1

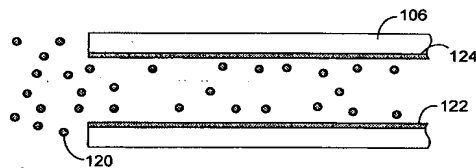


FIG. 3

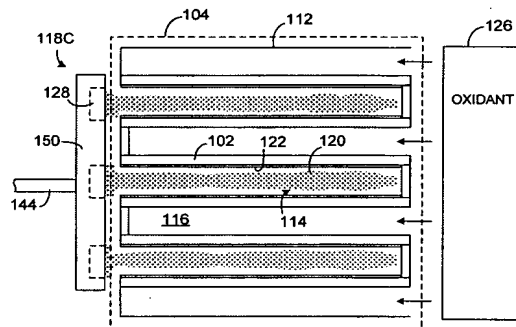


FIG. 8

indicate that fuel is directed into the fuel passages in a direction that is non-perpendicular to (and substantially parallel to) the anode surfaces 124.

Turning to Figure 8, a formal version of which is reproduced below, the drawings clearly show that the fuel droplets 120 continue in the direction indicated by the arrows in Figure 1 as the fuel droplets travel from the left side of the anode (which is part of the fuel cell 102) to the right side. [See also Figures 4, 7, 9, 13, 18 and 19.] Applicant respectfully submits that one of skill in the art would recognize that the word "path" describes the route along which something travels. Clearly, in the case of the fuel droplets 120, that path extends in a direction that is non-perpendicular to (and substantially parallel to) the anode surfaces 124.

In view of the forgoing, applicant respectfully submits that the application, as filed, provided support for the subject matter now recited in claim 82-89 and that the "new matter" objection under 35 U.S.C. § 132 should be withdrawn.

The specification has also been amended to amplify the above-described aspects of some of the inventions. It should be noted that there is no "new matter" bar to amendments that make the specification conform to matter disclosed in the drawings. See, e.g., *In re Benno*, 226 USPQ 683, 686-687 (Fed. Cir. 1985).

B. The Rejection Under 35 U.S.C. § 112, First Paragraph

With respect to the manner in which subject matter recited in the claims can be supported in specification, the “claimed subject matter need not be described *in haec verba* in the specification in order for that specification to satisfy the description requirement.” *In re Smith and Hubin*, 178 USPQ 620, 624 (CCPA 1973). Rather, applicant need only convey to those skilled in the art that, as of the filing date sought, he or she was in possession of the claimed invention. “One does that by such descriptive means as words, structures, figures, diagrams, formulas, etc., that fully set forth the claimed invention.” *Lockwood v. American Airlines, Inc.*, 41 USPQ2d 1961, 1966 (Fed. Cir. 1997).

Turning to the support in the application for the subject matter now recited in claims 82-89, applicant notes that although the application as filed did not include the exact phrase “a fuel supply path extending in a direction that is non-perpendicular (or “substantially parallel”) to the anode surface that receives fuel,” such a path is clearly illustrated in the Figures. The fuel droplets flowing along such a path is also clearly illustrated. Accordingly, the application as filed provided support for the subject matter recited in claims 82-89 and the rejection under 35 U.S.C. § 112, first paragraph, should be withdrawn.

III. PRIOR ART REJECTIONS

A. The Rejections

Claims 1-3, 7, 8, 11-15, 17 and 20 have been rejected under 35 U.S.C. § 102 as being anticipated by the Kindler '594 patent. Claims 4-6 have been rejected under 35 U.S.C. § 103 as being unpatentable over the Kindler '594 patent. Claim 9 has been rejected under 35 U.S.C. § 103 as being unpatentable over the combined teachings of the Kindler '594 patent and the Singh '993 patent. Claim 16 has been rejected under 35 U.S.C. § 103 as being unpatentable over the combined teachings of the Kindler '594 patent and the Pun '382 patent. The rejections under 35 U.S.C. §§ 102 and 103 are respectfully traversed. Reconsideration thereof is respectfully requested.

B. Discussion Concerning Claims 1-3 and 7

Independent claim 1 calls for a combination of elements comprising “a fuel cell stack including a **plurality of anodes**” and “a **single fuel supply apparatus** that supplies a plurality of fuel droplets to each of the anodes.” Claims 2, 3 and 7 depend from independent claim 1 and include, *inter alia*, the combination of elements defined by claim 1. The Kindler ‘594 patent fails to teach or suggest such combinations.

For example, as discussed in the amendment filed February 12, 2004, the Kindler ‘594 patent describes a number of instances where only one fuel cell (and one anode) is present. More specifically, the Kindler ‘594 patent indicates that aerosol may be “formed in an aerosol generator situated within the anode chamber of the fuel cell,” “formed in an aerosol generator external to the anode chamber of the fuel cell and fed to the anode chamber via a duct,” or “formed externally to the anode chamber of the fuel cell, fed to a particle size conditioner situated between the aerosol generator and the anode chamber, and subsequently fed to the anode chamber via a duct.” [Column 2, lines 10-42.] Additionally, in the one instance where a stack of a plurality of fuel cells (and a corresponding plurality of anodes) is discussed, each anode includes its own aerosol generator(s). [Figure 6 and column 15, lines 57 to column 16, line 14.] The Kindler ‘594 patent does not, however, teach or even remotely suggest “a **single fuel supply apparatus** that supplies a plurality of fuel droplets to each of [a plurality of] anodes.”

In response to the arguments above, the Office Action states that in Figure 6 and column 15, lines 57 to column 16, line 14, Kindler ‘594 patent teaches “the use of a single aerosol generator to supply the fuel droplets to the anodes in the fuel cell stack” and that “the generator is composed of a plurality of nozzles.” [Office Action at page 7.] Although it is true that the aerosol generators discussed in this portion of Kindler ‘594 patent have a plurality of individual *in situ* atomizers and that nozzles are one example of *in situ* atomizers (column 15, line 66 to column 17, line 14), it is not true that there is “a **single** fuel supply apparatus that supplies a plurality of fuel droplets to **each** of [a plurality of] anodes.” To the contrary, the Kindler ‘594 patent

states that “[e]ach anode biplate 602 has an *internal surface comprising* a flowfield element 610 and *an aerosol generator*.” [Column 15, lines 63-65.] Each anode biplate 602 is, in turn, placed against the anode side of a membrane electrode assembly. [Column 14, lines 52-65 and column 16, lines 15-17.] In other words, the Kindler ‘594 patent specifically indicates that each anode biplate 602 has its own built-in apparatus for supplying fuel droplets to the associated anode. Moreover, to the extent that there are a plurality of anodes in the stack, there is a corresponding plurality of aerosol generators (i.e. one for each anode) and not a single aerosol generator that supplies fuel to all of the anodes.

As the Kindler ‘594 patent fails to teach or suggest each and every element of the combination recited in independent claim 1, applicant respectfully submits that claims 1-3 and 7 are patentable thereover and that the rejection thereof under 35 U.S.C. § 102 should be withdrawn.

C. Discussion Concerning Claims 4-6

Independent claims 4, 5 and 6 call for respective combination of elements including a “fuel cell” and a device that supplies fuel droplets. Claim 4 specifies that the device is a “thermal drop ejector,” claim 5 specifies that the device is a “piezoelectric drop ejector” and claim 6 specifies that the device is a “flexensional drop ejector.” The Kindler ‘594 patent fails to teach or suggest such combinations.

As noted on page 4 of the Office Action, the Kindler ‘594 patent does not disclose the use of “thermal,” “piezoelectric” and “flexensional” drop ejectors. Nevertheless, the Office Action states that it would have been obvious to substitute any one of the “thermal,” “piezoelectric” and “flexensional” drop ejectors for the ultrasonic atomizer disclosed in the Kindler ‘594 patent. [Office Action at pages 4 and 5.] The Office Action does not, however, include any evidence whatsoever (e.g. a prior art reference) which indicates that, in the context of supplying fuel to a fuel cell, “thermal,” “piezoelectric” and “flexensional” drop ejectors are “functionally equivalent” to an ultrasonic atomizer. Note, for example, that the flexensional drop ejector illustrated in Figures 16-18 of the present application may be used to fire drops in two directions. [Page 9, line 29 to page 10, line 11.] Nor has the Office

Action provided any evidence which indicates that it would have been obvious to replace an ultrasonic atomizer that is supplying fuel to a fuel cell anode with a “thermal,” “piezoelectric” or “flextensional” drop ejector.

Instead, the Office Action improperly relies on ***applicant’s disclosure*** to support the rejection. [Office Action at page 5 and 9.] The Office Action appears to opine that because applicant’s specification indicates that “thermal,” “piezoelectric” and “flextensional” drop ejectors may be used in some embodiments, while an “ultrasonic atomizer” is used in others, applicant has “admitted” that they are the “functional equivalent” of an “ultrasonic atomizer” and, therefore, that it would have been obvious to substitute “thermal,” “piezoelectric” and “flextensional” drop ejectors for the for the ultrasonic atomizer disclosed in the Kindler ‘594 patent. This aspect of the Office Action is incorrect both factually and as a matter of law.

With respect to the facts, nowhere in applicant’s specification is it “admitted” that “thermal,” “piezoelectric” and “flextensional” drop ejectors are the functional equivalent of an “ultrasonic atomizer.” Merely indicating that “the exemplary ultrasonic atomizer illustrated in Figures 21 and 22 and the exemplary flextensional drop ejectors illustrated in Figures 23a-26i, also have applications outside the fuel cell arena” is not an admission of functional equivalency. [Page 4, lines 15-17.] It is a simple statement which means that the ultrasonic atomizer illustrated in Figures 21 and 22 and the flextensional drop ejectors illustrated in Figures 23a-26i can be used in devices other than fuel cell related devices. No more, no less. Similarly, indicating that “ultrasonic atomizers may be used in place of thermal drop ejector in the embodiment illustrated in Figure 7” and that the “ultrasonic atomizer illustrated in Figures 20 and 21 may be used in place of thermal drop ejector(s) in any of the embodiments illustrated in Figures 4-8” is not an admission of functional equivalency. [Page 10, line 25 to page 11, line 9.] To the contrary, it merely indicates that inventors believe that, in some embodiments of their inventions, certain types of drop ejectors may be used in place of others. It is not a statement concerning what was recognized in the art prior to their inventions.

Turning to the law, the Office Action’s reliance on applicant’s disclosure to prove equivalence is completely improper. In order to rely on equivalence as a rationale supporting an obviousness rejection, the equivalency must be recognized

in the prior art, and **cannot be based on applicant's disclosure**. *In re Ruff*, 118 USPQ 340 (CCPA 1958), emphasis added, and MPEP § 2144.06.

Accordingly, applicant respectfully submits that the Office Action has again failed to make a *prima facie* case of obviousness with respect to claims 4-6 and that the rejection thereof under 35 U.S.C. § 103 is improper and should be withdrawn.

D. Discussion Concerning Claims 8, 9, 11-15 and 17

Independent claim 8 calls for a combination of elements comprising “a fuel cell stack including at least one anode pair arranged such that **the anodes within the anode pair face one another and define a fuel passage therebetween**” and “fuel supply means for **supplying a plurality of droplets to the fuel passage** between the at least one anode pair.” Claim 9 depends from independent claim 8 and includes, *inter alia*, the combination of elements defined by claim 8.

Similarly, independent claim 11 calls for a combination of elements comprising “a plurality of anodes pairs arranged such that the anodes within each anode pair face one another and define a fuel passage therebetween” and “a fuel supply apparatus that draws fuel from the fuel reservoir and supplies a plurality of fuel droplets to the fuel passages.” Claims 12 and 13 depend from independent claim 11 and include, *inter alia*, the combination of elements defined by claim 11.

Independent claim 14 is directed to a “method of operating a fuel cell stack having an anode pair arranged such that the anodes within the anode pair face one another and define a fuel passage therebetween.” The method includes, *inter alia*, the step of “directing a spray of fuel droplets into the fuel passage between the anode pair and onto the anodes.” Claims 15 and 17 depend from independent claim 14 and include, *inter alia*, the combination of elements defined by claim 14.

The Kindler '594 patent fails to teach or suggest the respective combinations defined by independent claims 8, 11 and 14. For example, as noted in the amendment dated February 12, 2004, the Kindler '594 patent fails to teach or suggest a fuel stack with anodes that face one another with a fuel passage therebetween. Nor does the Kindler '594 patent teach or suggest apparatus for, or the steps of, supplying fuel droplets to a fuel passage between two anodes.

In response, the outstanding Office Action appears to argue that the reference to an “anode chamber 616” in column 16 of the Kindler ‘594 patent is a reference to “an anode pair arranged such that the anodes within the anode pair face one another and define a fuel passage therebetween.” Applicant respectfully submits that this is simply incorrect. First, the Office Action is devoid of any evidence to support the apparent assertion that the Kindler anode chamber 616 is formed by an “anode pair” wherein the anodes “face one another and define a fuel passage therebetween.” Second, the Kindler patent’s reference to an “anode chamber 616” is made in the context of a single fuel cell 600 with a single anode biplate 602 which has its own, *internal* flowfield 610 and aerosol generator (e.g. a plurality of atomizers 612). That anode biplate 602 is, in turn, placed against the anode side of a membrane electrode assembly. [Column 14, lines 52-65 and column 16, lines 15-17.] In other words, the Kindler ‘594 patent specifically indicates that each anode biplate 602 has its own built-in apparatus for supplying fuel droplets to the anode side of a single membrane electrode assembly. It would appear to be very improbably that a fuel cell stack including this type of biplate would be arranged such that there was a second anode receiving fuel on the other side of the biplate.

As the Kindler ‘594 patent fails to teach or suggest each and every element or step in the respective combinations defined by independent claims 8, 11 and 14, applicant respectfully submits that claims 8, 11-15 and 17 are patentable thereover and that the rejection thereof under 35 U.S.C. § 102 should be withdrawn.

Turning to the rejection of claim 9 under 35 U.S.C. § 103, applicant respectfully submits that the Singh ‘993 patent fails to remedy the above-identified deficiencies in the Kindler ‘594 patent. Accordingly, claim 9 is patentable for at least the same reasons as independent claim 8 and the rejection of claim 9 under 35 U.S.C. § 103 should also be withdrawn.

E. Discussion Concerning Claim 16

Independent claim 16 calls for a combination of method steps including, *inter alia*, the step of “directing a spray of fuel droplets onto the anode by generating a spray of fuel droplets and blowing the droplets towards the anode *with a fan*.” The

Kindler '594 patent fails to teach or suggest such a combination. For example, the Kindler '594 patent does not teach or suggest blowing fuel droplets with a fan. The only time a fan disclosed in the Kindler '594 patent is used to supply air to a cathode. [Column 5; lines 51-54.] The Office Action has taken the position that, in view of the teachings of the Pun '382 patent, it would have been obvious to add a fan to one of the fuel cell devices disclosed in the Kindler '594 patent.

The Pun '382 patent is directed to "a spray apparatus that produces uniform sized atomized droplets controllable **from fog size to larger** for spraying fungicides, bactericides, pesticides, insecticides, plant nutrients and other materials applied to crop, ground, and foliage for agricultural and horticultural benefaction." [Abstract.] Figure 14 is also noteworthy. Nothing in the Pun '382 patent even remotely suggests its teaching are applicable to fuel droplets generally, and fuel cells in particular. In fact, the Pun '382 patent does not include the word "fuel" or the word "cell."

As the Federal Circuit reiterated once again in *In re Lee*, 61 USPQ2d 1430, 1433 (Fed. Cir. 2002), "a showing of a suggestion, teaching, or motivation to combine the prior art references is an 'essential component of an obviousness holding.'" [Citations omitted.] The burden of showing obviousness may be satisfied "only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references." [Id. at 1434, citations omitted.] Here, there is absolutely no reason, other than a hindsight attempt to replicate the claimed combinations, to combine the cited references in the manner proposed in the Office Action.

Accordingly, applicant respectfully submits that the Office Action has failed to make a *prima facie* case of obviousness with respect to claim 16 and that the rejection thereof under 35 U.S.C. § 103 is improper and should be withdrawn.

F. Discussion Concerning Claim 20

Independent claim 20 calls for a combination of elements including, *inter alia*, "a controller adapted to monitor a rate of fuel consumption at the anode and to control the fuel supply means to supply droplets at a rate that results in a **fuel layer being**

maintained on the anode.” Although the Kindler ‘594 patent does discuss varying the amount of fuel supplied to the anode (column 7, line 31-46), it does not appear to teach or suggest maintaining a layer of fuel on the anode. The Kindler ‘594 patent actually appears to teach away from the formation of a fuel layer. [Column 8, lines 18-29.] Nevertheless, the outstanding Office Action indicates that, in view of the drop discussion in column 8, lines 30-48, the Examiner has concluded that fuel layer “can be formed on the anode after the fuel droplets collide and coalesce.” [Office Action at page 8.]

Applicant respectfully submits that there are a variety of errors associated with this conclusion. Most notably, it is not supported by the Kindler ‘594 patent.³ The Office Action also conveniently ignores the fact the Kindler ‘594 patent spends approximately the next full column of text after the passage cited in the Office Action (i.e. from column 8, line 49 to column 9, line 50), explaining how to avoid saturation of the porous anode and, accordingly, the formation of a fuel layer on the anode.

The rejection of claim 20 under 35 U.S.C. § 102 is, therefore, improper and should be withdrawn.

IV. CLOSING REMARKS

In view of the foregoing, it is respectfully submitted that the claims in the application are in condition for allowance. Reexamination and reconsideration of the application, as amended, are respectfully requested. Allowance of the claims at an early date is courteously solicited.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is respectfully requested to call applicant’s undersigned representative at (310) 563-1458 to discuss the steps necessary for placing the application in condition for allowance.

The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 08-2025. Should

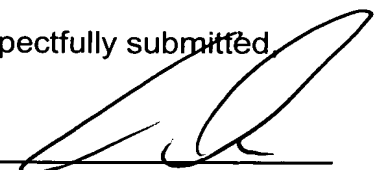
³ To the extent that the Examiner has taken “official notice” with respect to knowledge generally available in the art, applicant hereby traverses and requests that the Examiner provide an affidavit in accordance with MPEP § 2144.03 and 37 C.F.R. § 1.104(d)(2) to that effect.

such fees be associated with an extension of time, applicant respectfully requests that this paper be considered a petition therefor.

5/20/04
Date

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Respectfully submitted



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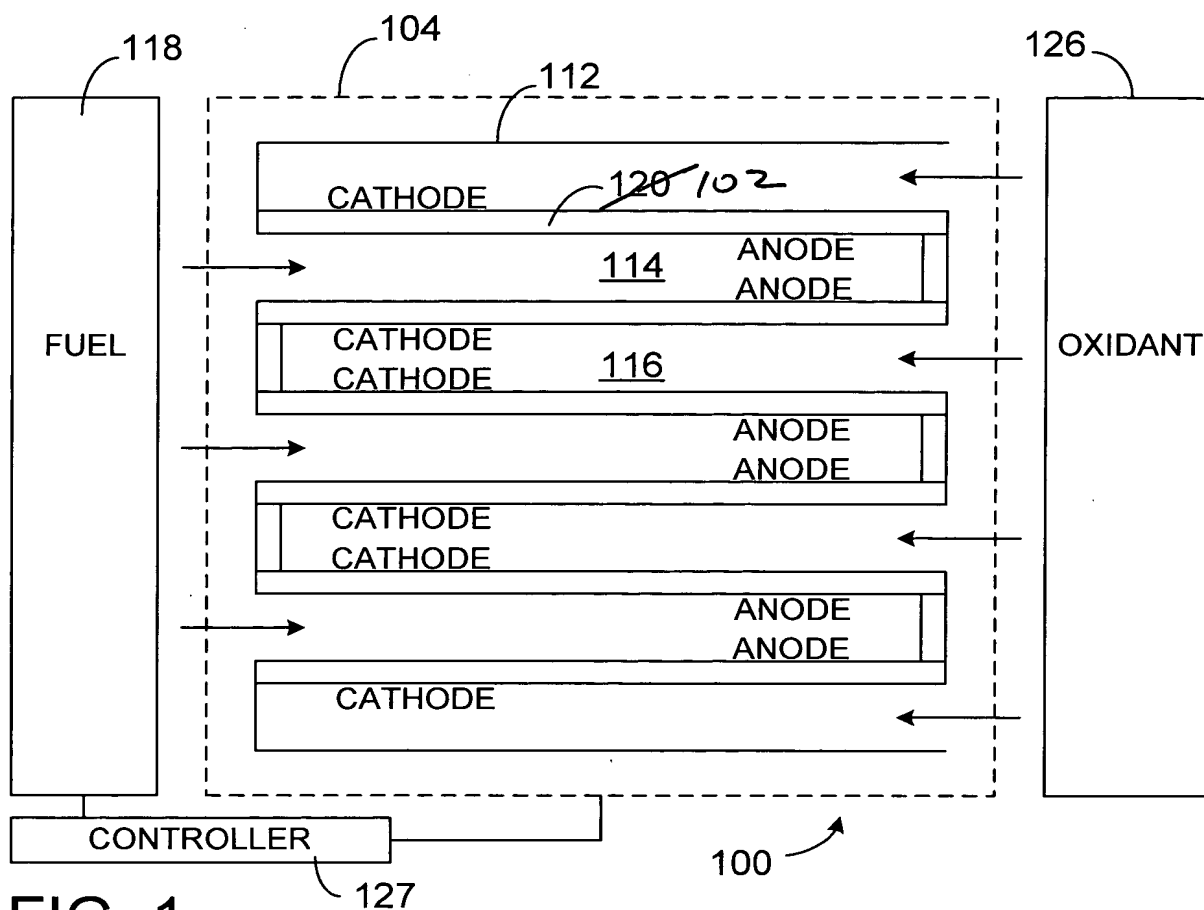


FIG. 1

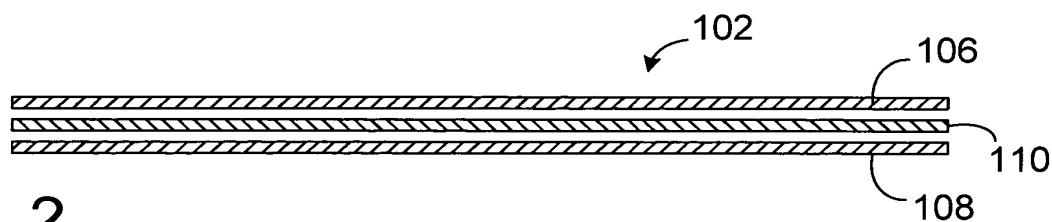


FIG. 2

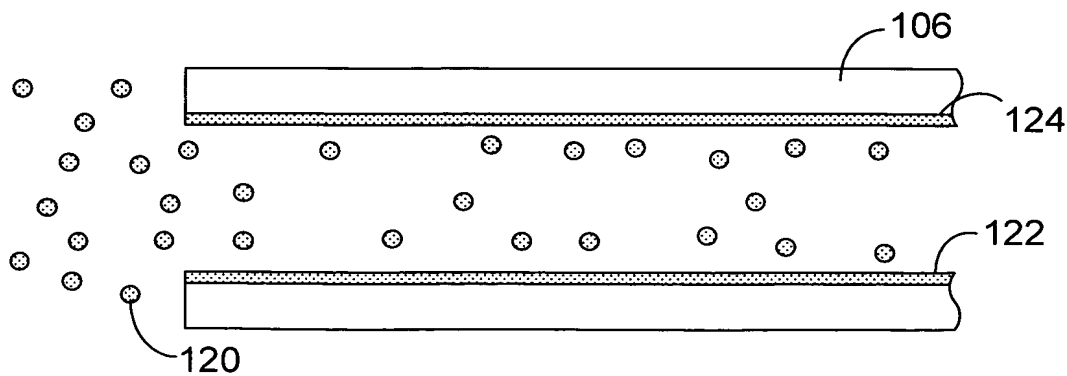


FIG. 3